

What is claimed is:

1. A vertical MOS transistor comprising:
  - a semiconductor substrate of a first conductive type;
  - an epitaxial growth layer of said first conductive type formed on said semiconductor substrate;
  - a body region of a second conductive type formed on said epitaxial growth layer;
  - a trench formed through said body region of said second conductive type so as to reach an inside of said epitaxial growth layer of said first conductive type;
  - a gate insulating film formed along a surface of said body region of said second conductive type and a wall surface and a bottom surface of said trench;
  - a polycrystalline silicon gate formed in said trench so as to be in contact with said gate insulating film and surrounded by said gate insulating film;
  - a metal silicide gate as a film formed in said trench so as to be in contact with said polycrystalline silicon gate and surrounded by said gate insulating film and said polycrystalline silicon gate;
  - a source region of said first conductive type formed on said surface of said body region of said second conductive type and around said trench so as to be in contact with said gate insulating film;
  - a gate electrode connected to said polycrystalline silicon

gate and said metal silicide gate;

a source electrode connected to said source region; and  
a drain electrode connected to said semiconductor substrate.

2. A vertical MOS transistor as claimed in claim 1, characterized in that said film formed in said trench so as to be in contact with said polycrystalline silicon gate and surrounded by said gate insulating film and said polycrystalline silicon gate is a silicon compound.

3. A vertical MOS transistor as claimed in claim 2, characterized in that said film formed in said trench so as to be in contact with said polycrystalline silicon gate and surrounded by said gate insulating film and said polycrystalline silicon gate is a silicon oxide film.

4. A vertical MOS transistor as claimed in claim 2, characterized in that said film formed in said trench so as to be in contact with said polycrystalline silicon gate and surrounded by said gate insulating film and said polycrystalline silicon gate is a silicon nitride film.

5. A vertical MOS transistor as claimed in claim 1, characterized in that said film formed in said trench so as to be in contact with said polycrystalline silicon gate and so as to be surrounded by said gate insulating film and said polycrystalline silicon gate is a metal film.

6. A method of manufacturing a vertical MOS transistor

comprising the steps of:

forming a body region of a second conductive type from a main surface of a semiconductor substrate of a first conductive type by injection and thermal diffusion of impurity of said second conductive type;

forming a trench by carrying out anisotropic etching from a region on said body region where a trench is to be formed through said body region of said second conductive type to an inside of said semiconductor substrate;

forming a gate insulating film along a surface of said body region and a wall surface of said trench;

depositing on said gate insulating film a polycrystalline silicon layer having a thickness of half or less of a width of said trench;

forming on said polycrystalline silicon layer a metal silicide layer as a film having a thickness more than a difference between half of said trench width and the thickness of said polycrystalline silicon layer;

etching said metal silicide layer;

etching said polycrystalline silicon layer to form a gate in said trench; and

forming a source region of said first conductive type on said surface of said body region and in contact with said gate insulating film.

7. A method of manufacturing a vertical MOS transistor as claimed in claim 6, characterized in that said film formed on said polycrystalline silicon layer is a silicon oxide film.

8. A method of manufacturing a vertical MOS transistor as claimed in claim 6, characterized in that said film formed on said polycrystalline silicon layer is a silicon nitride film.

9. A method of manufacturing a vertical MOS transistor as claimed in claim 6, characterized in that said film formed on said polycrystalline silicon layer is a metal film.